

Ultrafast LEDs For Optical Wireless Communication

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BACKGROUND

Light emitting diodes (LEDs) directly convert electronic modulations into light signals and play an essential role in optical wireless communications links. Modulation speed and quantum efficiency of LEDs have been major challenges in achieving better optical wireless communications systems. Plasmonic structures represent a promising approach to improve both the brightness and speed of LEDs because of the delicate dynamic interactions between the light emission materials and surface plasmons. In current plasmonic-based LEDs, the plasmonic enhancement frequencies are typically misaligned with the light emission frequencies of the LEDs, significantly limiting their practical applications. Of relevance to this problem are artificially engineered materials, or metamaterials, with unique properties not attainable with naturally occurring substances.

TECHNOLOGY DESCRIPTION

University researchers are developing LEDs with ultrafast electronic modulation rates. In the invention, appropriately engineered optical plasmonic metamaterials are integrated into blue and green LEDs to drastically improve the spontaneous light emission speed, leading to ultrafast modulation capabilities. The new LEDs provide a multitude of possibilities in the design and engineering of new optical communication systems as well as their ready integration into upgradable systems. They represent a new class of cost-effective and high performance LEDs with unprecedented modulation speed, exceptionally high quantum efficiency, and high compactness. As such, they fulfill the requirement of emission within the transparency window for super speed underwater optical wireless communications.

RELATED MATERIALS

- ▶ [Material Developed by UC San Diego Engineers Could Speed Up Underwater Communications by Orders of Magnitude](#)
- ▶ [The Navy's New Underwater Internet](#)

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,361,336	07/23/2019	2013-257
United States Of America	Issued Patent	9,865,768	01/09/2018	2013-257

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OTHER INFORMATION

KEYWORDS

LED, metamaterials, plasmonics,
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CATEGORIZED AS

- ▶ **Optics and Photonics**
 - ▶ All Optics and Photonics
- ▶ **Communications**
 - ▶ Optical
 - ▶ Wireless
- ▶ **Materials & Chemicals**
 - ▶ Nanomaterials

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